

III. "Researches on Solar Physics.—No. II. The Positions and Areas of the Spots observed at Kew during the years 1864–66, also the Spotted Area of the Sun's visible disk from the commencement of 1832 up to May 1868." By WARREN DE LA RUE, Esq., Ph.D., F.R.S., F.R.A.S., BALFOUR STEWART, Esq., LL.D., F.R.S., F.R.A.S., Superintendent of the Kew Observatory, and BENJAMIN LOEWY, Esq., F.R.A.S. Received February 15, 1870.

(Abstract.)

The paper commences with a continuation for the years 1864–66 of Tables II. and III. of a previous paper by the same authors; it then proceeds to a discussion of the value of the pictures of the sun made by Hofrath Schwabe, which had been placed at the disposal of the authors, and the result is that these pictures, when compared with simultaneous pictures taken by Carrington and by the Kew heliograph, are found to be of great trustworthiness. From 1832 to 1854 the pictures discussed are those of Schwabe, who was the only observer between these dates; then follows the series taken by Carrington, and lastly the Kew series, which began in 1862.

A list is given of the values of the sun's spotted area for every fortnight, from the beginning of 1832 up to May 1868, and also a list of three-monthly values of the same, each three-monthly value being the mean of the three fortnightly values which precede and of the three which follow it. These three-monthly values are also given for every fortnight.

A plate is appended to the paper, in which a curve is laid down representing the progress of solar disturbance as derived from the three-monthly values; and another curve is derived from this by a simple process of equalization, representing the progress of the ten-yearly period. The values of the latter curve, corresponding to every fortnight, are also tabulated. From this Table are derived the following epochs of maxima and minima of the longer period:—

Minimum	Nov. 28, 1833.	
Maximum		Dec. 21, 1836.
Minimum	Sept. 21, 1843.	
Maximum		Nov. 14, 1847.
Minimum	April 21, 1856.	
Maximum		Sept. 7, 1859.
Minimum	Feb. 14, 1867.	

This exhibits a variability in the length of the whole period.

Thus we have between 1st and 2nd minimum..... 9·81 years.

2nd and 3rd do. 12·58 „

3rd and 4th do. 10·81 „

Mean of all the periods 11·07 years.

Another fact previously noted by Sir J. Herschel is brought to light,

namely, that the time between a minimum and the next maximum is less than that from the maximum to the next minimum.

Thus the times from the minimum to the maximum are for the three periods 3.06, 4.14, and 3.37, while those from the maximum to the minimum are 6.75, 8.44, and 7.44 years.

In all the three periods there are times of secondary maxima after the first maximum ; and in order to exhibit this peculiarity, statistics are given of the light-curve of R Sagittæ and of β Lyræ, two variable stars which present peculiarities similar to the sun.

Finally, the results are tested to see whether they exhibit any trace of planetary influence ; and for this purpose the conjunctions of Jupiter and Venus, of Venus and Mercury, of Jupiter and Mercury, as well as the varying distances of Mercury alone in its elliptical orbit, have been made use of, and the united effect is exhibited in the following Table, the unit of spotted area being one-millionth of the sun's visible hemisphere :—

Angular separation.	Excess or Deficiency.			
	Jupiter and Venus.	Venus and Mercury.	Mercury alone (Perihelion=0).	Mercury and Jupiter.
0 to 30	+ 881	+ 1675	— 380	— 227
30 to 60	— 60	— 139	— 1188	— 317
60 to 90	— 452	— 1665	— 1287	— 594
90 to 120	— 579	— 2355	— 1262	— 714
120 to 150	— 705	— 2318	— 1208	— 508
150 to 180	— 759	— 1604	— 1027	— 491
180 to 210	— 893	— 481	— 519	— 416
210 to 240	— 752	+ 547	+ 430	— 189
240 to 270	— 263	+ 431	+ 1082	— 25
270 to 300	+ 70	+ 228	+ 1436	+ 154
300 to 330	+ 480	+ 1318	+ 1282	+ 164
330 to 0	+ 1134	+ 2283	+ 586	— 45

IV. "On the Contact of Conics with Surfaces." By WILLIAM SPOTTISWOODE, M.A., F.R.S. Received February 16, 1870.

(Abstract.)

It is well known that at every point of a surface two tangents, called principal tangents, may be drawn having three-pointic contact with the surface, *i. e.* having an intimacy exceeding by one degree that generally enjoyed by a straight line and a surface. The object of the present paper is to establish the corresponding theorem respecting tangent conics, viz. that "at every point of a surface ten conics may be drawn having six-pointic contact with the surface ;" these may be called Principal Tangent Conics. In this investigation I have adopted a method analogous to that employed in my paper "On the Sextactic Points of a Plane Curve" (Phil.